

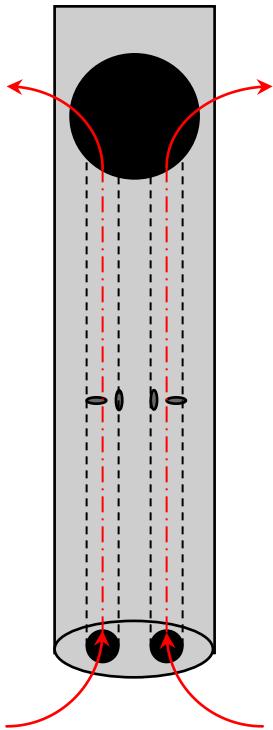


# Technical Overview

## YSI 6-Series Sondes



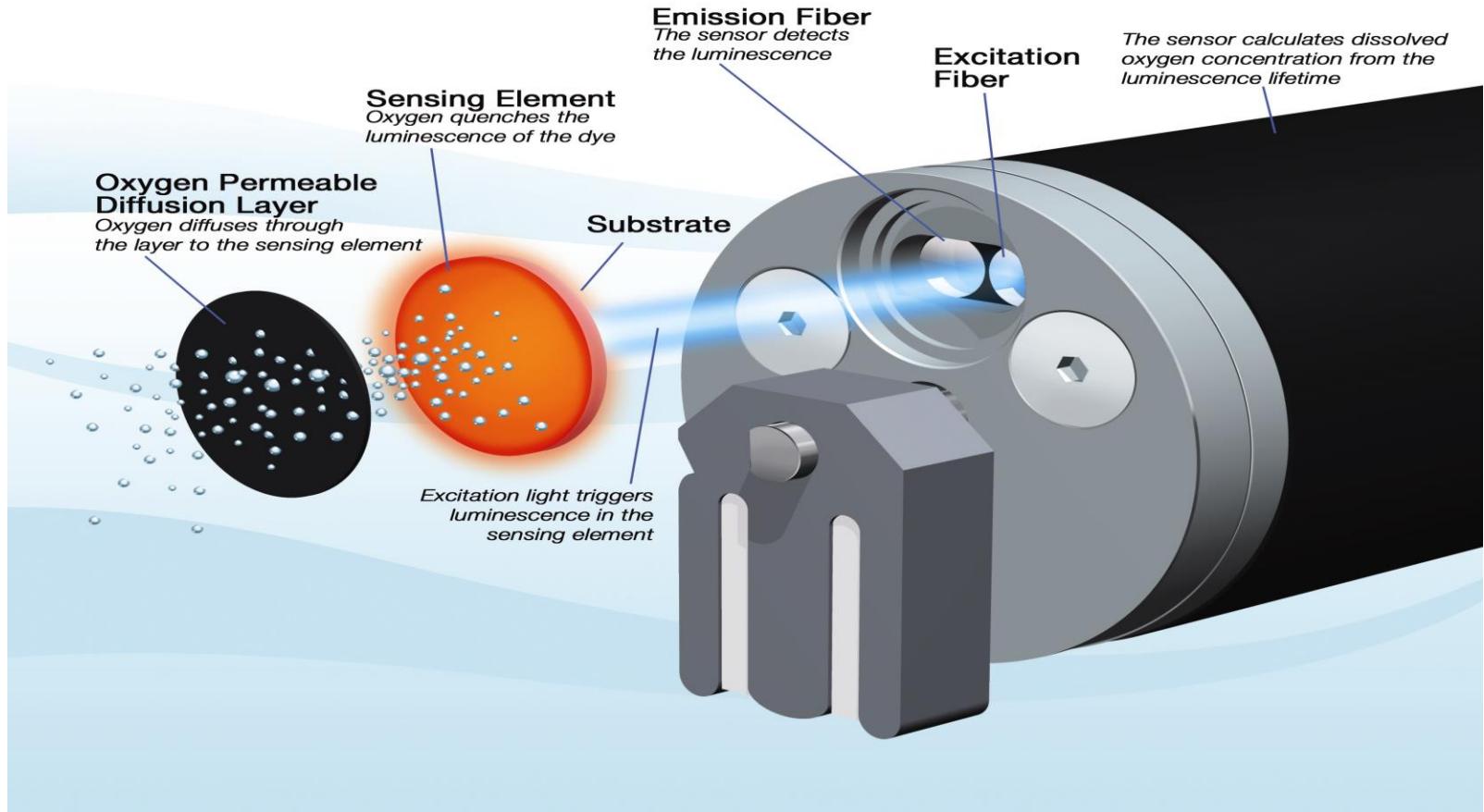
# Conductivity



- AC voltage applied to nickel electrodes
- Conductivity electrodes placed in sample to be measured
- Electrical current flows through the electrodes and the sample
- Electrical current level has direct relationship with conductivity of the solution
- 4 pure nickel electrodes
- Cell constant = 5.00
- Temperature probe
- Fresh, brackish and sea water

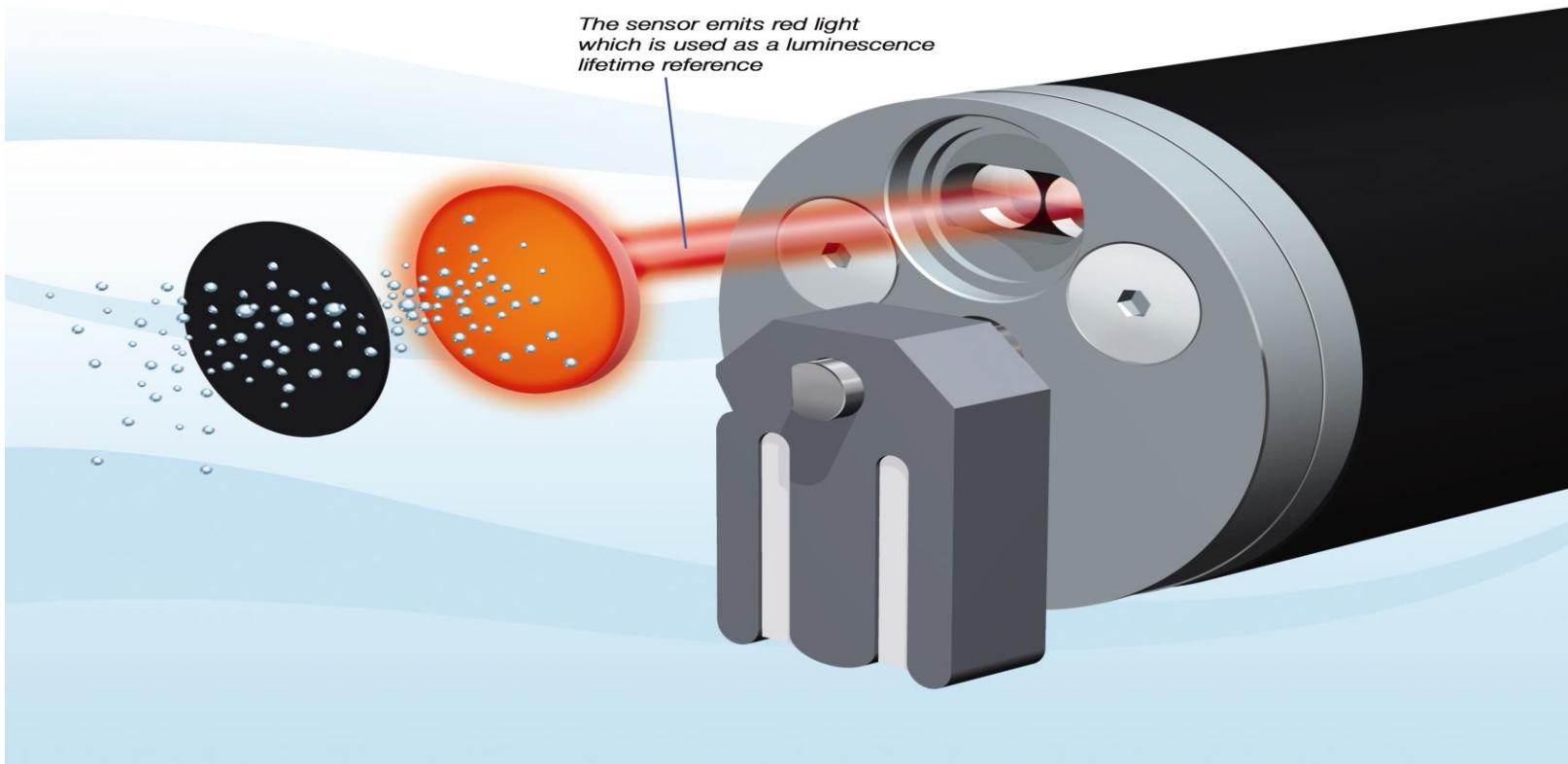
**Specific Conductance = Conductivity corrected to 25°C.**

# Optical DO



Step 1: The sensor emits blue light, which causes the sensing element to luminesce red light. In the presence of oxygen, the sensor measures a change in phase-shift of luminescent emissions as a function of oxygen concentration. The luminescence signal from the blue excitation is compared to that of the red excitation (next slide) and a stable DO concentration is calculated.

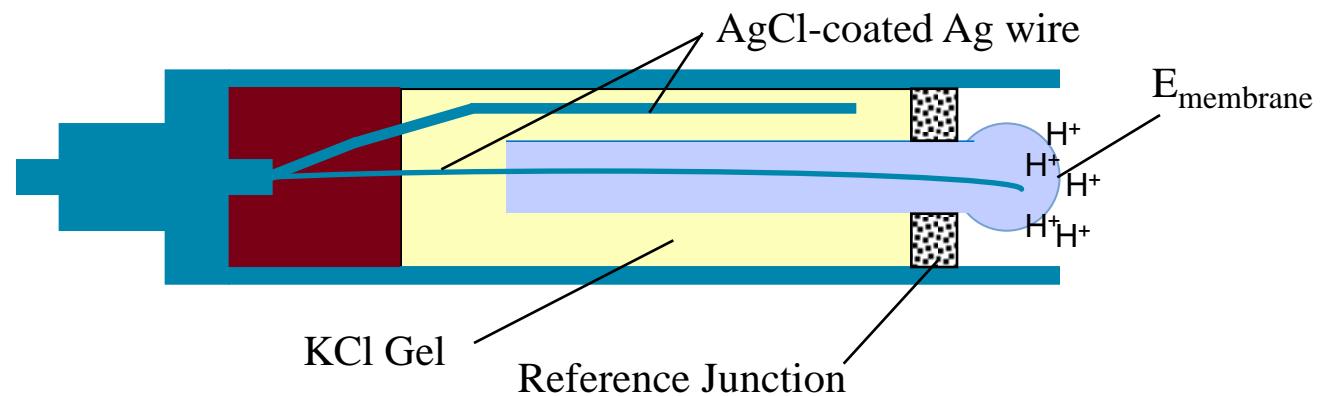
# Optical DO



Step 2: The sensor emits red light, which is reflected by the sensing element. The reflected red light is measured by the sensor and serves as a reference for the lifetime luminescence calculations

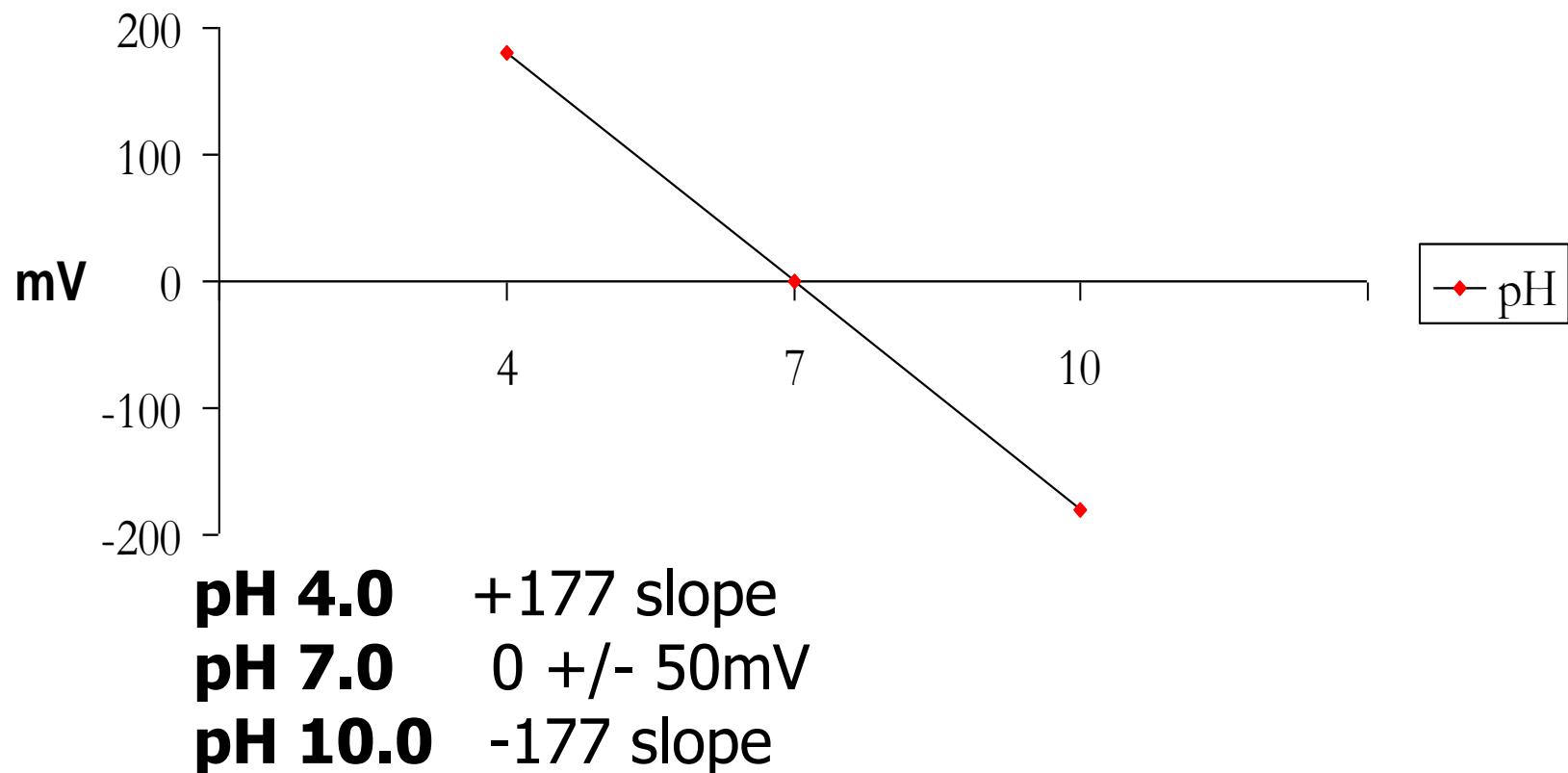
# pH

- Glass sensing bulb is filled with solution of stable pH (pH 7) so inside of glass surface experiences constant binding of H<sup>+</sup> ions
- Outside of bulb is exposed to sample where H<sup>+</sup> varies
- Differential of H<sup>+</sup> creates a potential which is read versus the stable potential of the reference electrode



pH

## Plot - Nernst Equation



**pH**

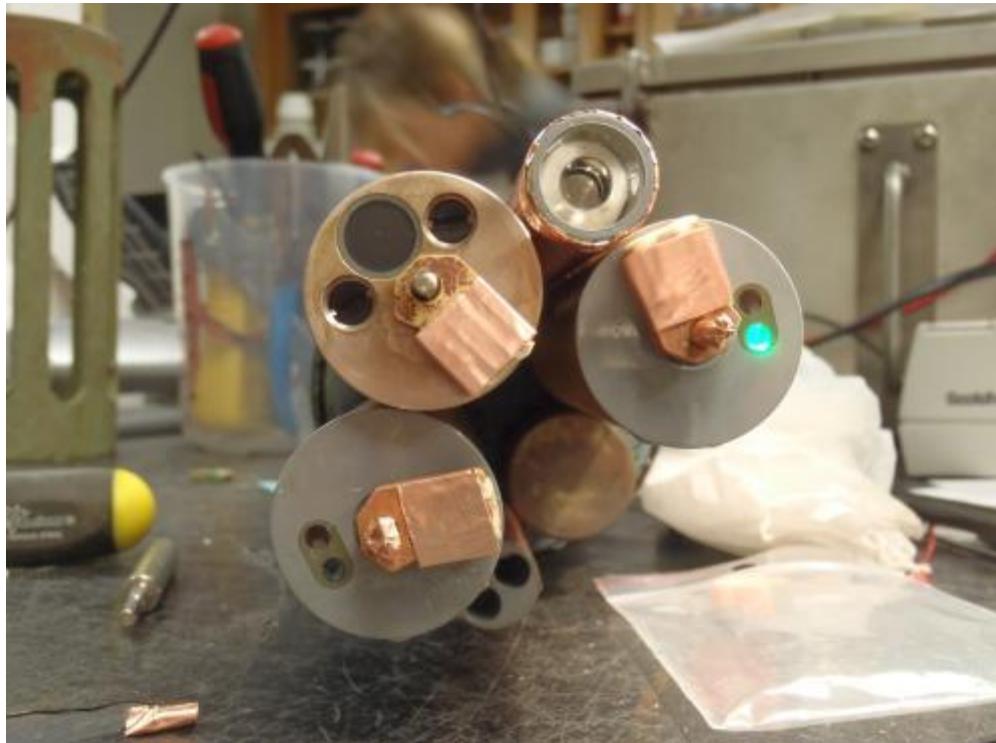
## Sensor Cost of Ownership

<b>pH Sensor</b>	<b>YSI</b>	<b>Brand H</b>	
Initial Cost	\$210	\$450	
24 Month Replacement	\$210	\$100	Frits & Refill Solution
24 Month Replacement	\$210	\$100	Frits & Refill Solution
		\$400	Glass Bulb Replacement
<b>Total</b>	<b>\$630</b>	<b>\$1,050</b>	

advantages:

- Thinner glass bulb = more responsive sensor in all applications
- Do not need to replace junctions, maintain seals, etc = less maintenance required

# The ROX DO Membrane



- The membrane has a unique calibration that must be entered into the probe when changed
- Once entered the coefficients remain in the ROX probe
- Membranes are not interchangeable unless the coefficients are transferred too
- Yearly replacement is recommended

# ROX Probe with AF-Wiper

- The ROX membrane should be replaced yearly
- The membrane has unique calibration coefficients that are specific to each membrane



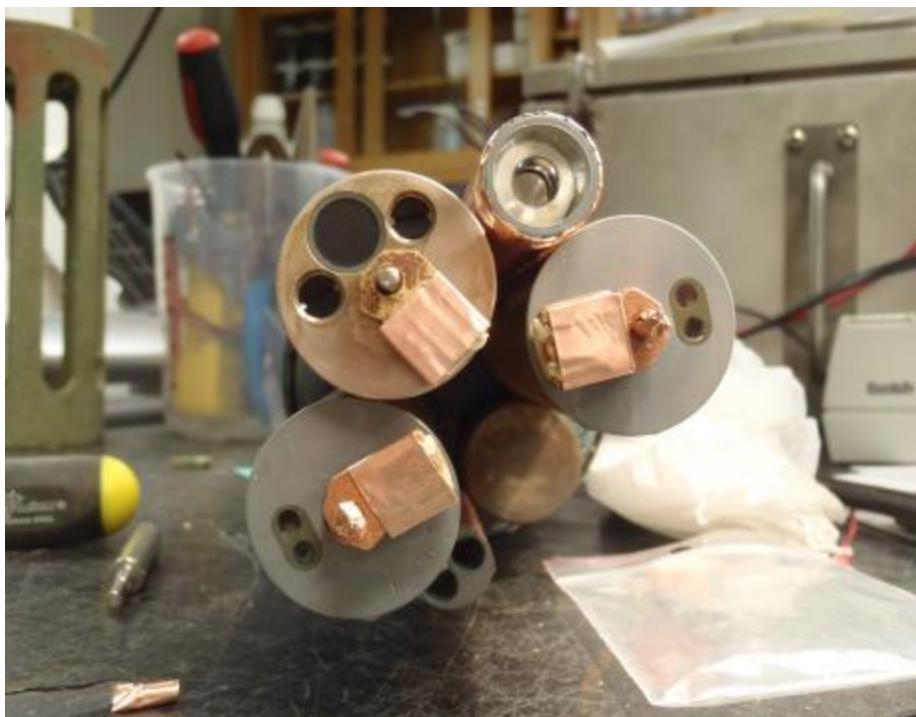
# New ROX Membrane Design

In November 2009 YSI released a new fouling resistant ROX membrane. This new metal membrane is more durable and is fouling resistant.



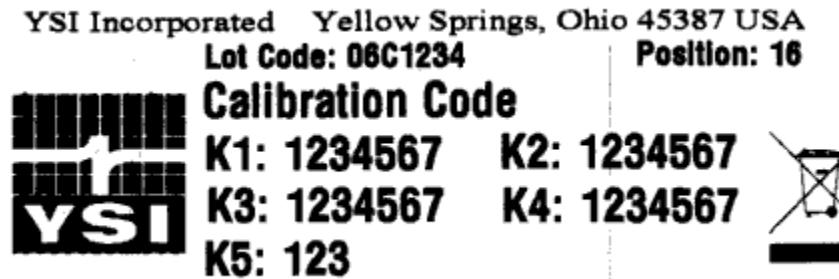
# New ROX Membrane cont.

Over time the metal ROX membrane will discolor this is normal  
If you have optical probes remember that the quad seal and bearing must be serviced every 2 years!



# New ROX Membrane cont.

- The temperature compensation factor for the new AF membranes is different than the original black plastic
- Check your ROX Temp Co # in the Advanced Sensor Menu of your sonde
- The Temp Co for the metal membrane is 1.32% per degree C. The older plastic is 1.5% per degree C.
- Verify your sondes setting



2006: 1.27%

2008: 1.5%

2011: 1.32% (starting with sonde serial numbers 11L100449)

# Mold on Membrane after Long Term Storage

Membrane was capped for 3 months

Mold formed on the wiper and membrane face

Mold will not harm the probe or membrane

Remove with warm water and dish washing soap



# Know your 6 series numbers

## Conductivity 6560 sensor

- Cell constant      5.0   +/- .45

## Integrated sensor (600R, 600OMS)

- Cell constant      5.0   +/- .70

## pH

7 buffer                0 +/- 50 mV

10 buffer               180 +/- 50 mV

4 buffer               - 180 +/- 50 mV

- Slope                165 to 180 mV

## Dissolved Oxygen

### ROX

- ODO gain                0.85 to 1.15
- Temp Co                1.32 %
- Membrane replaced    1 year
- Black paint removed   < 30%
- Quad Seal replaced    2 years

### Rapid Pulse DO

- Charge                25 to 75
- DO gain               0.7 to 1.4

# 6 series product timeline - preliminary

Year	Product	2015	2016	2017	2018	2019	2020	2021	2022
	6600 EDS								
	600 XL-V2								
	600 XLM-V2								
	600 QS								
	6500								
	6820								
	6920								
	600 XLM								
	600 LS								
	600 XL								
	600 R								
	6600								
	6820V2								
	6600V2								
	6920V2								
	600 OMS								
	650 Handheld								

DRAFT TIMELINE - FINAL PLAN WILL BE PUBLICALLY RELEASED IN JANUARY 2015

First half - LTB, January-June

Second Half - Official Discontinuation Process via Lynn/Ops

2020 & beyond is too far out, prohibiting us to make any guarantees of availability





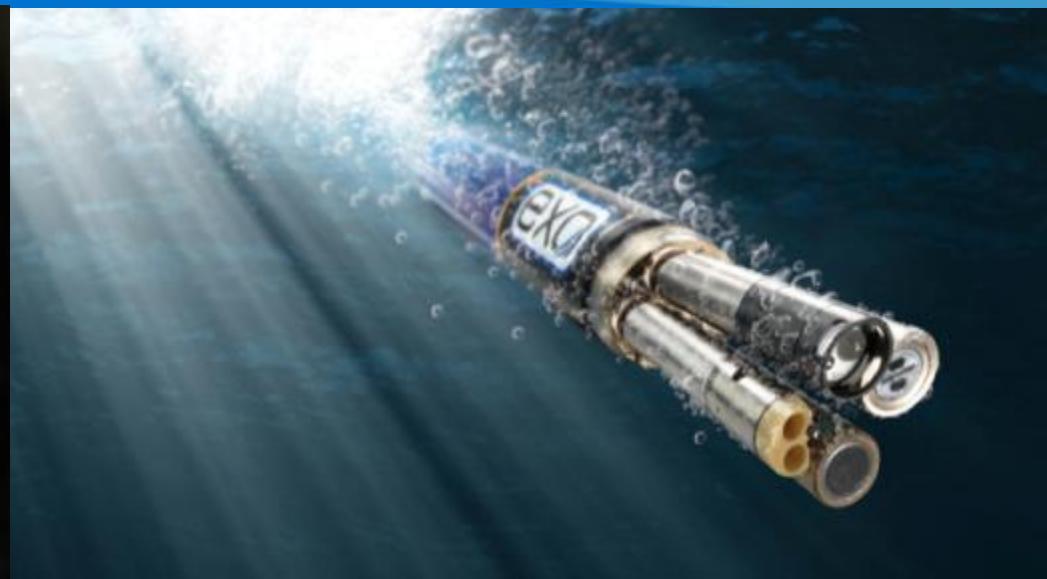
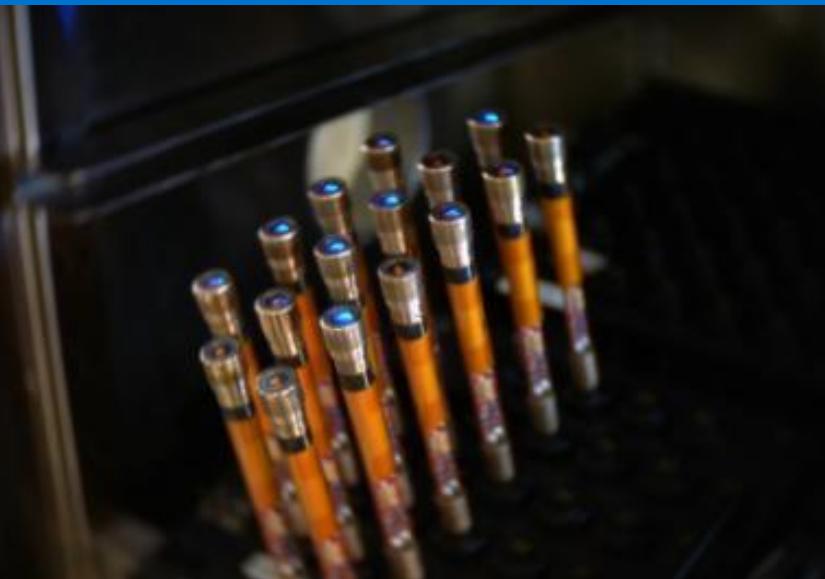
Advanced Water Quality  
Monitoring Platform



a **xylem** brand

# EXO Overview

The Stronger, Faster, Smarter Monitoring Platform





# EXO 1 Sonde

EXOwater.com



[Introducing EXO](#) [9:08]



**Sampling and Ground Water  
4 sensor ports**

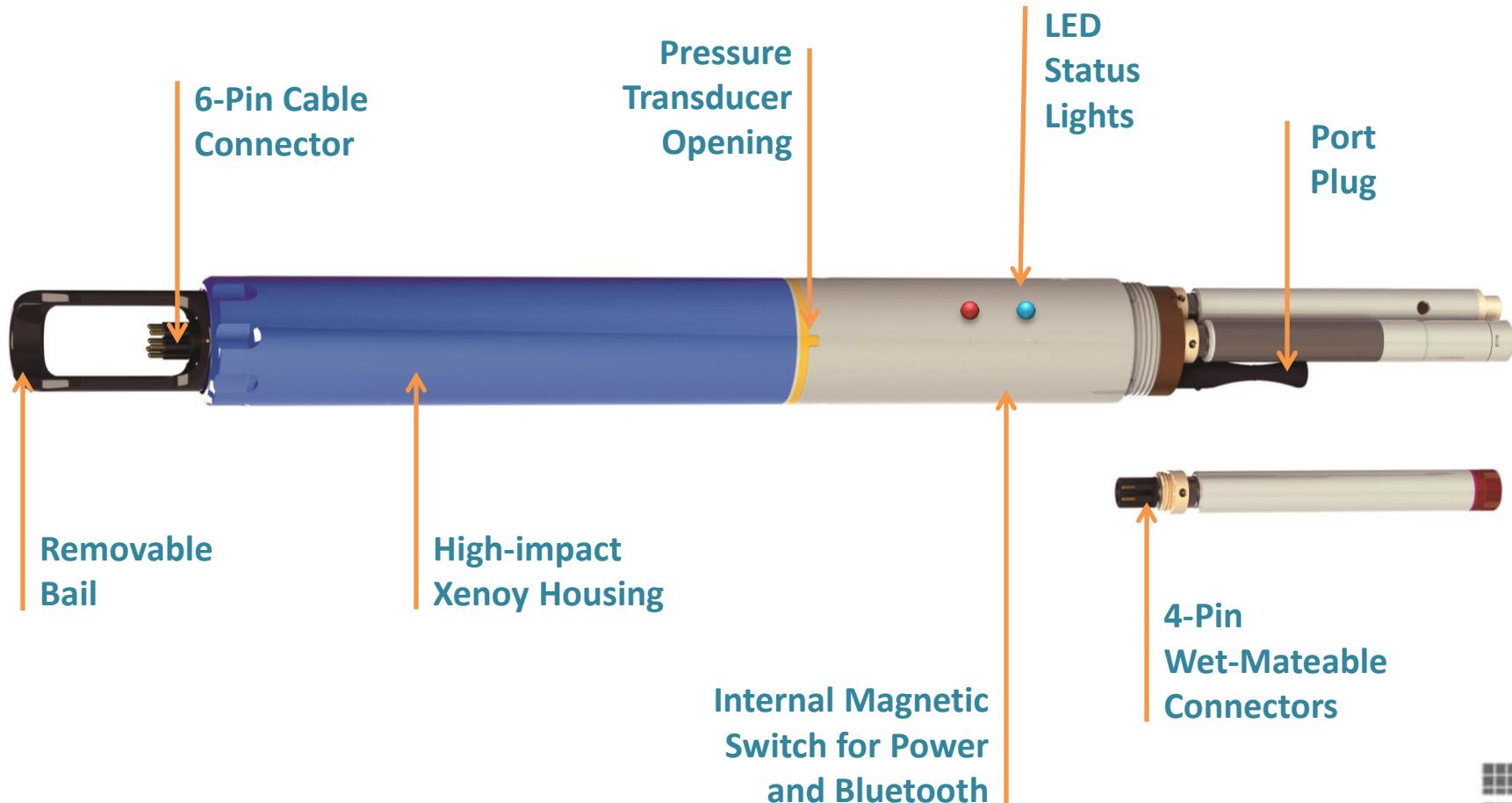
Diameter: 4.70 cm (1.85 in)

Length: 64.77 cm (25.50 in)



# EXO 1 Sonde

EXOwater.com



[EXO Materials Science Overview](#) [3:21]

# EXO 2 Sonde

EXOwater.com



[What Ships with EXO? \[2:07\]](#)



**Continuous Monitoring**

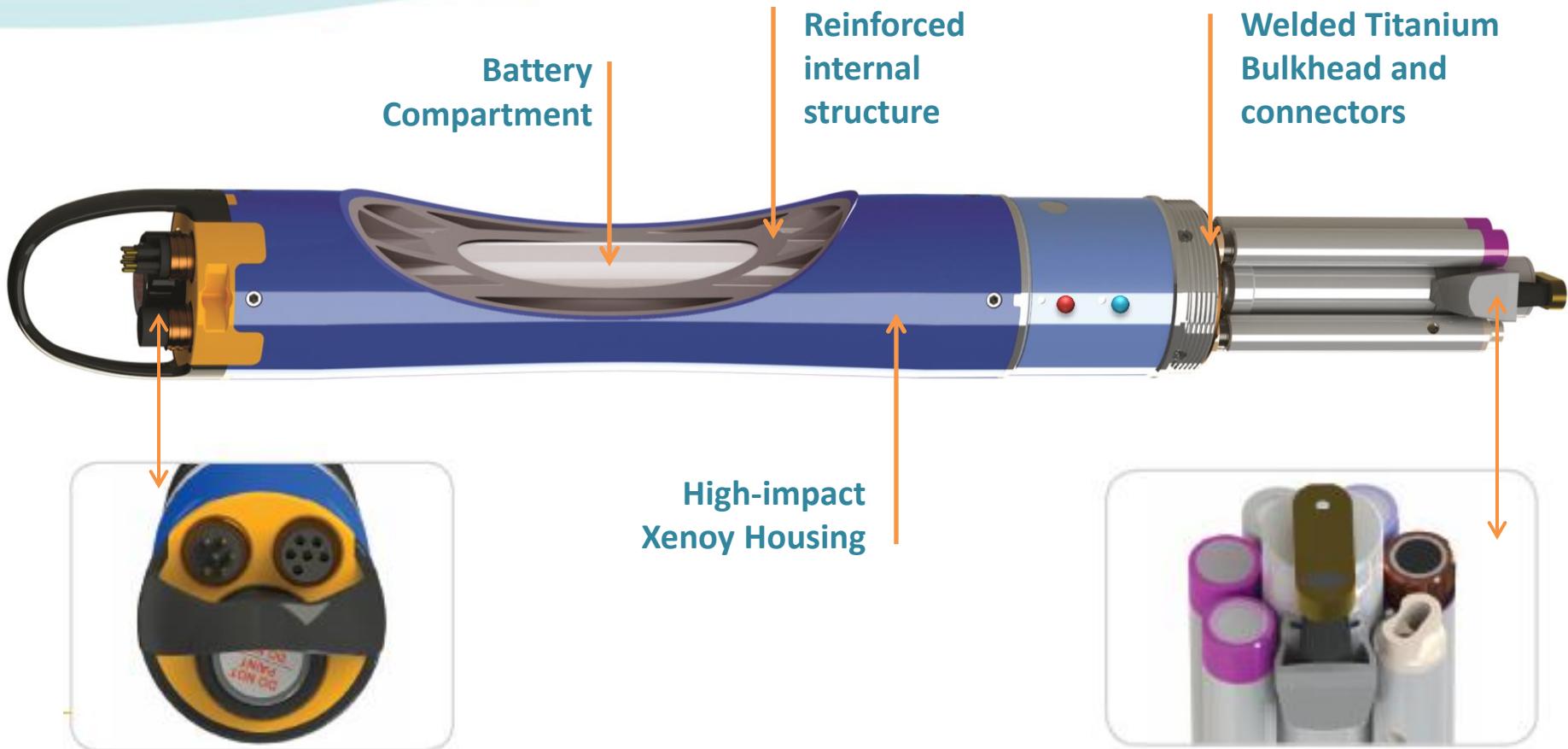
**6 ports + wiper port**

Diameter: 7.62 cm (3.00 in)

Length: 71.10 cm (28.00 in)

# EXO 2 Sonde

[EXOwater.com](http://EXOwater.com)



Cable connector, battery valve, and expansion port for an additional sensor

Anti-fouling wiper keeps sensors clear of biofouling and lengthens deployment times by 25%

# EXO Smart Sensors

[EXOwater.com](http://EXOwater.com)



## Conductivity and Temperature

- Improved Temp. accuracy and response
- Improved Conductivity range
- Required for all monitoring applications



## Total Algae

- Two sensors in one
- Chlorophyll + BGA-PC or PE



## Turbidity

- Increased range without loss of accuracy



## Smart Wiper System

- For use with EXO2 platform
- Superior anti-fouling
- Faster sampling response



[EXO Smart Ports – Smart Sensors](#) [1:46]

# EXO Smart Sensors

EXOwater.com



## Ph + ORP

- Removable probe head
- Guarded and Unguarded versions



## Fluorescent Dissolved Organic Matter (fDOM)

- New for YSI



## Ion Selective Electrode

- Replaceable module
- Ammonium, Chloride, Nitrate



## Optical Dissolved Oxygen

- Improved accuracy above 200%
- Faster response
- Screw-on membrane



[Replacing pH/ORP Sensor Module](#) [1:46]



[Replacing ODO Sensor Cap](#) [1:46]

# EXO Handheld

- Full-Color LCD
- Bluetooth, USB & GPS
- Wet-Mateable Connector
- Barometer
- IP-67 Housing
- Windows CE 5.0
- KOR Software



KOR



[Rechargeable Li-Ion Battery Pack](#) [4:14]



a xylem brand

# What's new with EXO?



## Smart Ports

- Any Sensor – Any Port
- Sensor Auto-detection
- Customize the payload for *your* application
- AC Capacitive Coupling (protects electrical circuitry from shorting out)



[EXO Smart Ports – Smart Sensors](#) [1:46]



SmartQC 



# What's new with EXO?

## Auto-recognition

The auto-recognition capability of the EXO Sonde ports helps to eliminate gaps in data.

Plug in a sensor and automatically start logging data.

There are microprocessors in the sensors and the Sonde. This allows communication between the two – simplifying the process for the user.



SmartQC

# What's new with EXO?



## Titanium Sensors

- 250m depth rating
- Laser welded seals
- Durable titanium construction
- Stores calibration and metadata
- Wet mateable connectors
- Fewer parts, wires, and connectors



SmartQC 

# What's new with EXO?

## Biofouling Protection



Photo shows sensor after 90-day deployment in the productive waters of the Gulf of Mexico.

EXO2 deployed and tested for 4 years at this site.

EXO2 central wiper balances power efficiency, ease of use, and improved reliability. Lowers overall maintenance costs.





# What's new with EXO?

## Cable-free Operation

- Wireless communication
- Transfer data from Sonde to handheld
- Calibrate wirelessly in the lab
- No need for RS-232 ports
- Utilizes latest electronic components
- Up to 10 meter operating range



# What's new with EXO?



## Assisted Calibration

Graphical KOR software speeds up the calibration process while reducing reagent consumption.

Calibration cues help user through process ensuring efficient use of time.



[How Often Should I Calibrate? \[4:52\]](#)



# What's new with EXO?



## Smart Quality Control

Embedded microprocessors in each sensor along with calibration metadata allows EXO to warn users of calibration errors.

Automatic sensor detection and graphical interface greatly reduces errors.

Automatically generate calibration worksheet to provide audit trail.



# EXO Calibration data files

Calibration Worksheet

pH 13K102592

	UTC Time	Eastern Standard Time
Start Date/Time	4/21/2014 04:15:32 PM	4/21/2014 11:15:32 AM
End Date/Time	4/21/2014 04:18:25 PM	4/21/2014 11:18:25 AM
Previous Calibration Date/Time	1/1/1970 12:00:00 AM	12/31/1969 07:00:00 PM

Sensor Type	pH
Sensor SN	13K102592
Sensor Firmware Version	1.1.3
Calibration Parameter	pH

Sonde Type	EXO1 Sonde
Sonde SN	13L100327
Sonde Firmware Version	1.0.9
Sonde ID	Sonde 13L100327

 QC Score

	Cal Point 1	Cal Point 2	Cal Point 3
Standard	7.00 pH	10.00 pH	
Pre Calibration Value	7.26 pH	10.32 pH	
Post Calibration Value	7.00 pH	10.00 pH	
Raw Value (pH mV)	-15.49	-194.49	
Temperature	23.45 ° C	22.95 ° C	
Additional Input 1 (N/A)			
Additional Input 2 (N/A)			
Additional Input 3 (N/A)			
Type	YSI pH 7 Buffer	YSI pH 10 Buffer	
Manufacturer	YSI	YSI	
Lot Number			
Calibration Point Accepted	YES	YES	
Stability Achieved	YES	YES	

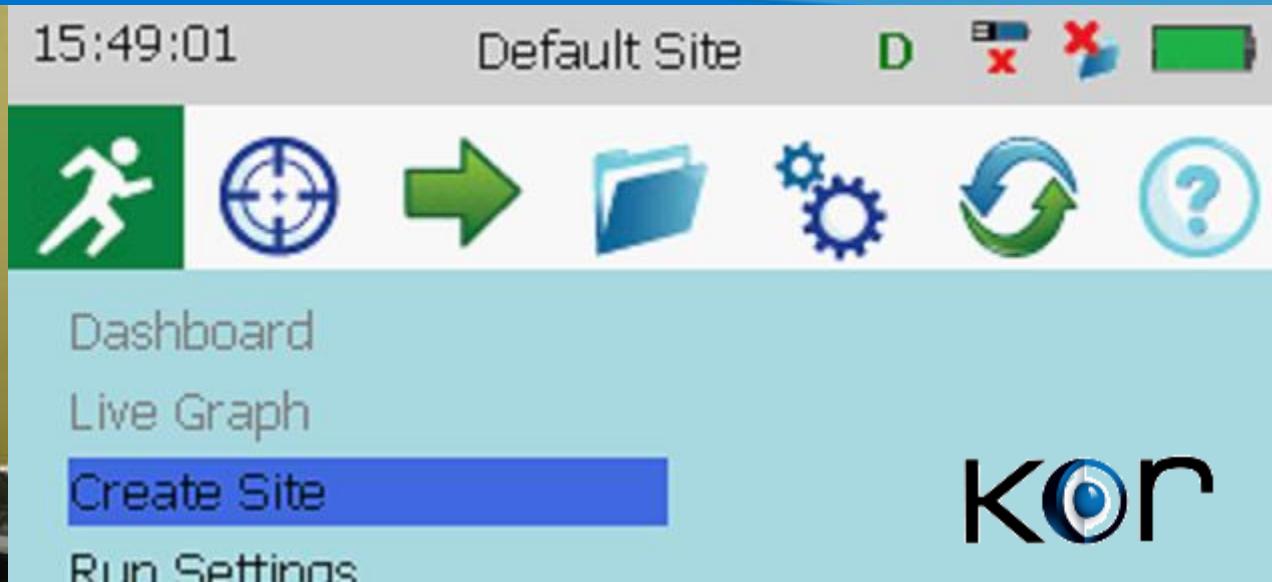
Completed	YES
Applied	YES
Valid	YES
Sensor Removed	NO
Uncalibrated	NO

Hardware	EXO Desktop
KOR Version	1.0.8

Additional Post Calibration Info:  
pH 7.00 and 10.00 Delta Slope 179.00 mV  
59.67 mV per pH unit

# KOR Software

Desktop and Handheld Software for the EXO Platform



The screenshot shows the KOR Software interface. At the top, there is a header bar with the time "15:49:01", the site name "Default Site", and several status icons (green "D", red "X", blue "X", green battery). Below the header is a toolbar with icons for Dashboard (green person), Live Graph (blue target), Create Site (green arrow), Run Settings (blue folder), Gear (blue gear), Refresh (green circular arrow), and Help (blue question mark). The main area has four buttons: "Dashboard", "Live Graph", "Create Site" (which is highlighted with a blue background), and "Run Settings". In the bottom right corner, there is a large, stylized "kor" logo.

15:49:01 Default Site D X X

Dashboard Live Graph Create Site Run Settings

kor

# KOR Software



## Live Demo

You can also view a recorded demo on YouTube:

-  [Introduction to KOR software](#) [2:58]
-  [KOR: Connecting via Bluetooth](#) [7:37]
-  [KOR: EXO Sensor Calibration](#) [7:51]
-  [KOR: Deployment Templates](#) [7:32]





# Accessories

Everything Else for the EXO Platform



# Accessories

[EXOwater.com](http://EXOwater.com)



Field cables



USB Signal  
Output Adapter



DCP (SDI-12) Signal  
Output Adapter



Multiple carrying  
case options



Lithium-Ion  
Battery pack

## Other accessories:

- Storm3 Data Logger
- Anti-fouling sensor guards
- Flow cells



[EXO Accessories List](#)



[EXO Full Parts List](#)



[Field Survival Guide \[2:07\]](#)

# Video Quick Reference



Click the play icons in this presentation to watch helpful YouTube videos about the EXO platform.



[Introducing EXO](#) [9:08]



[Rechargeable Li-Ion Battery Pack](#) [4:14]



[Make the Switch to EXO](#) [5:04]



[Field Survival Guide](#) [2:07]



[What Ships with EXO?](#) [2:07]



[Changing Batteries and Tips](#) [3:21]



[EXO Materials Science Overview](#) [3:21]



[Replacing ODO Sensor Cap](#) [1:46]



[EXO Smart Ports – Smart Sensors](#) [1:46]



[Replacing pH/ORP Sensor Module](#) [1:46]



[How Often Should I Calibrate?](#) [4:52]



[EXO Quality Tests](#) [1:20]



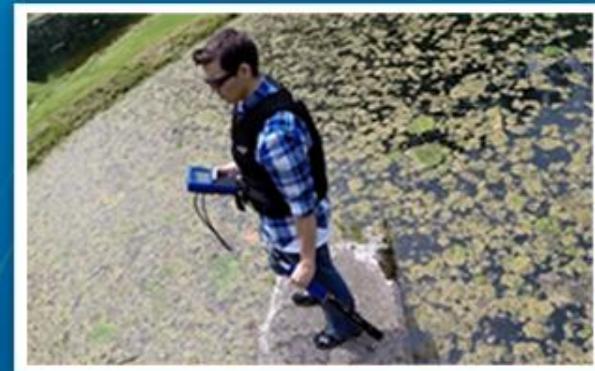
# Join our on-demand training program for Water Quality Sondes.



Learn from the experts



Detailed product review



Real-world applications

Join us at...

# EXO-University.com



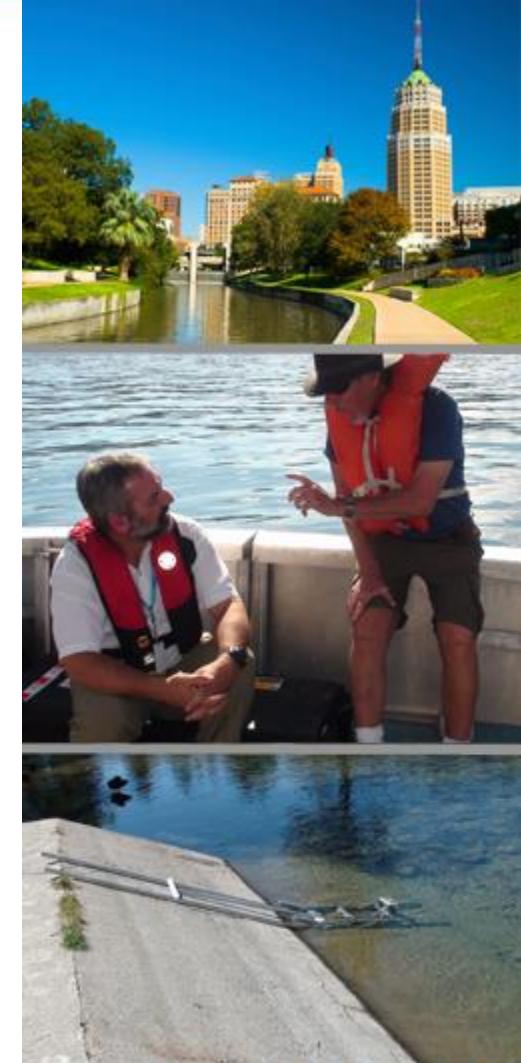
a xylem brand

# ADCP Flow Measurement: Dopplers, Data and More!

Friday, November 14<sup>th</sup>  
Edwards Aquifer Authority, San Antonio

Guest Speaker:  
Marcus Gary  
Senior Hydro geologist, Edwards Aquifer Authority

- What's new in the Acoustic technology world?
- What kind of technology is best used to collect data in extreme conditions (floods and droughts)?
- New ways to apply ADCPs in reservoirs and hydrographic survey work
- Field demonstrations



# Questions?

Ask our team of experts at [EXOwater.com](http://EXOwater.com) or [YSI.com](http://YSI.com)

